Miniature X-ray Source for Planetary Exploration Instruments, Phase I

Completed Technology Project (2007 - 2007)

Project Introduction

The objective of the proposed work is to develop a design model for a CNT cold cathode, low power, passively cooled, and grounded-anode X-ray tube that is compatible with a miniature XRD system designed for future space exploration. We propose to develop a miniature X-ray source for instruments for in situ measurements on planetary surfaces.This X-ray source will integrate an X-ray emitting vacuum tube and both low and high-voltage power supply into a compact and lightweight unit. This X-ray source will enable further miniaturized X-ray instruments to be deployed for surface and subsurface exploration of the solar system. The basis of this innovation is in the application of state of the art materials to produce a low power passively cooled grounded-anode X-ray tube. These objectives will be achieved with an X-ray source that combines the advantage of easy thermal management and simple control electronics. The concept relies on the use of state of the art ceramic materials that combines very good electrical insulation properties with good thermal conductivity. This source will allow using the grounded cathode geometry for simple and compact electronics, and rely on the heatsink properties of the ceramic electrical insulator for heat dissipation to the ground. The most promising material is for this application is Aluminum Nitride (AlN). Objective specifications for the source to be developed are as follows: Accelerating voltage.....25 kV Electron Beam current.....200 micro Amps X-ray spot size.....50 microns, Max. X-ray Tube Dimensions, (lxd)...45 mm x 15 mm X-ray tube mass..... grams Power conditioner volume..... cc Power conditioner mass..... grams

Primary U.S. Work Locations and Key Partners

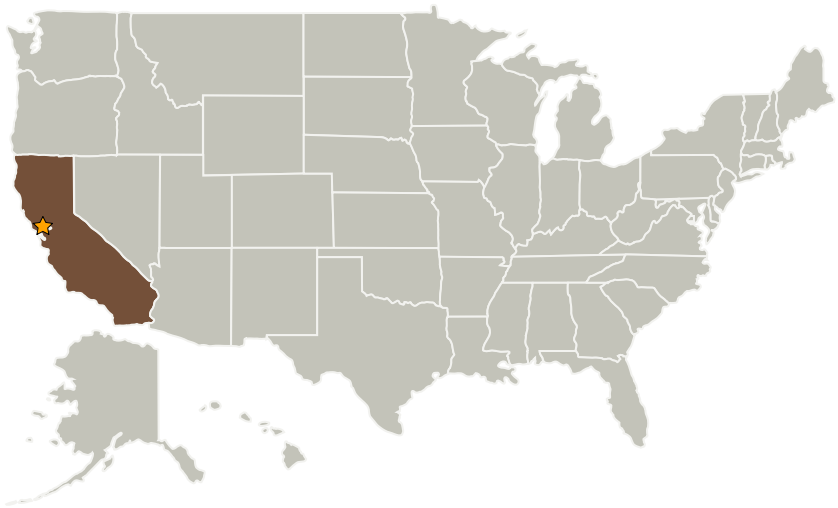

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
inXitu, Inc.	Supporting Organization	Industry	Mountain View, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.4 Network Provided Position, Navigation, and Timing
    - TX05.4.2 Revolutionary Position, Navigation, and Timing Technologies